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Abstract

Conversational rules of everyday communication are applied to the interaction between experimenters and subjects. According to these rules, contributions to a communication should be informative, relevant, true, and unambiguous. It is assumed that subjects determine the pragmatic meaning of instructions and questions on the basis of these rules and the provided context. In contrast to most natural settings, standardized experimental procedures rarely allow for an interactive determination of pragmatic meaning and often preclude feedback as a corrective device. As a consequence, subjects are required to rely heavily on general rules, and even subtle cues may become informationally loaded. The information extracted from context cues may often not be intended by the experimenter. Thus subjects may infer more than they are supposed to, resulting in discrepancies between the experimenter's intended and subjects' inferred meaning of the instructions. If researchers are not sensitive to the information provided by verbal and non-verbal context cues, their interpretation of research results may be based on biased data. Evidence from different research domains is reported to support the presented assumptions and their implications for bias avoiding strategies are discussed.

The Informative Function of Research Procedures: Bias and the Logic of Conversation

As experimental psychologists we learn to be aware that certain aspects of our research methods may reduce the validity of our results. Aronson, Ellsworth, Carlsmith, and Gonzales (1990) distinguish two types of artifacts, namely bias due to unintended influences of the experimenter (Rosenthal, 1966, 1969) and bias due to subjects' reactions towards demand characteristics (McDavid, 1965; Orne, 1962, 1969; Weber & Cook, 1972). In his seminal discussion of demand characteristics, Orne (1962) assumed that subjects are motivated to look for cues in the experimental situation that provide them with the experimenter's hypothesis. In order to play the role of a "good subject"[1], participants in experiments may then respond according to the suspected hypothesis.

Orne's analysis initiated a considerable amount of research on the validity of experimental findings, the roles of subjects in the experiment, and related topics (e.g. Adair & Schachter, 1972; Carlston & Cohen, 1980; McDavid 1965; Weber & Cook, 1972; for an overview see Kruglanski, 1975). However, the discussion focussed on subjects' motivation to detect and to act according to the experimenter's hypothesis, and on the resulting threatened validity, rather than on the process of <u>how</u> subjects infer the experimenter's hypothesis on the basis of the experimental situation. In a cognitive interpretation of demand effects, Wyer (1974) suggested that subjects may use the information provided by experimental cues in the same way as any other information. Although this assumption helps us understand how the provided information is used, it does not solve the more basic problem of how exactly this information is extracted from the instructions and the experimental setting.

Experimental Artificiality versus Natural Situations

Subjects' knowledge of being in a scientific experiment is a key element in Orne's analysis (Orne, 1962, 1969). By agreeing to participate, subjects accept a "special form of social interaction" (Orne, 1962, p. 777) between themselves and the experimenter. It is argued that this special form of interaction creates an experimental artificiality that consists of several components. First, subjects "implicitly agree to perform a wide range of actions or requests without inquiring as to their purpose" (Orne, 1962, p. 777). In addition, subjects' response alternatives are often very restricted. Finally, it is argued that due to the reduced implications of the experimental outcome, subjects are less motivated than in natural settings. From this perspective, an experimental situation elicits systematically different responses than would the same situation in a natural context. Often, such differences may be driven by subjects' motivation to act as "good subjects".

In contrast to Orne's emphasis on the uniqueness of the experimenter - subject interaction, we argue that subjects may apply the same rules that guide social discourse in natural settings to experimental situations. However, the application of these rules is often not appropriate due to the uniqueness and constraints of the experimental setting (Hilton, 1990, 1991). Although the resulting effects may in part be similar, we suggest a different underlying mechanism, that does not rely on the assumption that subjects are motivated to enact the role of a "good subject". As our arguments build on conversational rules in natural settings, we shall first introduce these rules, before we relate them to the experimental situation.

Conversational Rules in Natural Situations: The Co-Operative Principle

According to conceptualizations of everyday communication (Grice, 1975; Clark, 1985), communication proceeds according to a "co-operative" principle, and the success of

communication depends on the degree to which the participants co-operate. The co-operative principle is specified by four maxims (see Table 1).

Table 1 about here

First, a maxim of quantity demands that contributions are as informative as required, but not more informative than required. Second, a maxim of quality requires participants to provide no information they believe is false or lack adequate evidence for. Third, according to a maxim of relation, contributions need to be relevant for the aims of the ongoing interaction. Finally, a maxim of manner states that contributions should be clear, rather than obscure or ambiguous.

The Co-Operative Principle in Experimental Settings

Let us now apply these maxims, which guide communicators in producing and interpreting utterances in everyday life, to the experimental situation. The experimenter first asks subjects for help in the research process and exposes them to a situation with which they are by and large unfamiliar. To determine what they are supposed to do in this novel situation, they need to rely on the experimenter's instructions. The experimenter, however, is likely to provide either too much, too little, false, irrelevant, or ambiguous information, thus violating the expectation of co-operative conduct that the subjects bring to the lab. Nevertheless, until debriefing, the experimental situation requires subjects to believe the given information to be relevant, true, and sufficient for their task, and subjects are unlikely to perceive a violation of conversational norms.

From the subject's perspective it is not enough to understand the experimenter's contributions semantically, that is to comprehend the literal meaning of a word or a sentence.

Rather, the subject must also determine the meaning that is intended by the experimenter. To infer this pragmatic meaning of an utterance (Clark, 1985), subjects are required to go beyond the information given. In obeying the co-operative maxims, subjects will assume that (all) the information provided to them is relevant, and that neither too much, nor too little information is given for their task. Moreover, subjects are likely to presuppose that any part of the experiment is relevant to the previous parts, unless explicitly informed otherwise.

Note, however, that the information provided to subjects is not restricted to the experimenter's utterances. Rather, subjects may use apparently formal features of the questionnaire or the experimental setting as additional sources of information in determining the pragmatic meaning of their task, as we shall show in some detail below. Accordingly, our application of the Gricean maxims to the experimental setting extends their usual application from the interpretation of verbal utterances to the broader issue of determining the pragmatic meaning of a task. Although this "liberalised" application of Gricean maxims may seem controversial to linguists, the findings reviewed below will testify to its explanatory power.

The Impact of Experimental Standardization

It has been pointed out that a correct identification of the intended meaning is most likely when the social situation is largely unrestricted, and when the situation allows for a feedback loop between the speaker's intention and the listener's interpretation (Clark & Schober, 1989; Clark & Wilkes-Gibbs, 1986; Krauss & Weinheimer, 1964; Kraut, Lewis, & Swezey, 1982). Subsequent contributions can then be adapted to the requirements of the communication process.

In contrast, the communicative situation of an experiment is usually severely constrained. Instructions, questions, and response alternatives are often provided in a

standardized format for all subjects. Subjects are not provided with the option to ask the experimenter for more, clearer and more relevant information -- and if they do, they most likely will not receive it. Thus, the experimental situation can be regarded as a "standardized question situation" (cf., Strack, in press, a; Strack & Schwarz, in press).

The standardization of the experimental procedure allows researchers to reduce the variation within experimental conditions and unintended effects due to the experimenter (Aronson et al, 1990; Rosenthal, 1966, 1969). However, by eliminating the possibility of feedback, the standardization also forces subjects to interpret the intended meaning by relying more heavily on the context of the provided information than they usually would in natural situations. Due to the increased difficulty of determining the pragmatic meaning, subjects may interpret even subtle context cues, verbal and otherwise, to be informationally "loaded".

Bias as a Result of Going Beyond the Information Given

As a result, many situational cues may potentially become relevant when subjects are determining the pragmatic meaning of their task. Whether intended or not subjects may infer more than they are supposed to and the (additional) information provided by the cues may lead to a psychological meaning of the treatment that is not intended by the experimenter. However, an alteration of the psychological meaning of the treatment may be viewed as equivalent to an experimental artifact (Kruglanski, 1975, p. 116). Note that misunderstandings between experimenter and subject are unlikely to be detected, again due to the standardization of the experimental situation.

If the context cues change the inferred nature of the task, subjects' responses will systematically differ and the results will be biased: The observed effects are not solely due to the intended manipulation, but also to subjects' inferences based on the context cues. The

direction of bias resulting from these mechanisms is determined by how subjects' interpretations of the experimental setting differ from the experimenter's intention --
and not by subjects' motivation to comply with the experimenter's hypothesis. If the meaning that subjects infer works towards the experimenter's hypothesis, the effect will parallel the pattern of a demand effect.[2] However, the meaning that subjects infer may also work against the experimenter's hypothesis.

In contrast to Orne's argument, the suggested perspective does not require specific motivational assumptions that go beyond the general motivation to make sense of the experimenter's contributions. We assume that discrepancies between the experimenter's intended and the subjects' inferred meaning may often account for bias in experimental settings, and that motivations that are supposed to be specific for the experimental situation (such as "being a good subject") are often not necessary. As subjects rely heavily on the co-operative maxims in determining the nature of their task they might be described as "co-operative". This meaning of "co-operative" is, however, very different from the meaning used to describe "good" subjects who are especially vulnerable to demand effects (Sigall, Aronson, & Van Hoose, 1970). Note, that we do not want to deny a motivation to comply with the suspected hypothesis. Rather, we want to suggest another source of potential bias. In fact, before subjects could possibly respond in line with a "good subject" role, they need to infer the experimental hypothesis from the context cues. We argue that the presented perspective may provide us with a better understanding of this process.

We now turn to a selective review of experimental evidence that supports the perspective offered here. We intentionally omit studies bearing on the impact of conversational norms on attribution processes, as these have been discussed in detail by Hilton (1990, 1991). In presenting the evidence, we take the subject's perspective and distinguish between different

requirements during the course of the experiment. In the experiment, subjects have to find out, first, the pragmatic meaning of the task, second, which information they are supposed to use, and third, which information they are supposed to provide. Let us now consider each of these steps in detail.

Determining the Meaning of the Task

Before responding to an experimental task, subjects will try to determine what is intended by the given instructions. According to the above considerations, they may rely on subtle context cues and may draw inferences by using the co-operative maxims. We suggest that the immediate context, consisting of the experimenter's contributions before or after a question or instruction, is especially likely to provide these cues. For example, if several questions are asked, the direct context of a question could consist of the preceding question on the one hand, and the provided response alternatives on the other hand.

Preceding Questions as Sources of Information

In psychological experiments as well as in opinion polls, participants are often required to answer questions that may be phrased ambiguously, making it even more difficult to determine what is meant than is typically the case in language processing. Research in the domain of survey methodology demonstrated that respondents do not only readily answer such questions, but report attitudes and opinions even towards non-existent, fictitious issues (Schuman & Presser, 1981). In doing so, it seems unlikely, however, that subjects will simply "flip a mental coin", as was assumed by Converse (1970) and many researchers in the survey tradition. Rather, relying on the co-operative principle, subjects are likely to assume that the presented questions make sense and are asked in a meaningful order -- and that the

experimenter expects that subjects are able to answer them. As subjects expect a meaningful question, and do not have the option to ask the experimenter for clarification, they will try to determine the exact meaning of the question by other means. Thus, questions on fictitious issues are likely to be transformed into a better defined issue, that makes sense in the context in which the question is presented. As adjacent questions normally refer to each other, it is very likely that subjects try to use the content of the preceding question to disambiguate the meaning of an ambiguous subsequent one.

A study by Strack, Schwarz, & Wänke (1991, Experiment 1) supports these considerations. In this study, German college students were asked about their attitude towards an alleged "educational contribution". For half of the sample, this target question was preceded by a question about the average tuition fees that students have to pay at US universities. The other half of the sample had to estimate the amount of money that the Swedish government pays every student as a contribution to his or her living. As expected, students' attitude towards an "educational contribution" was more favorable when the context referred to money students received from the government ($\underline{M}$ = 4.7 on an 8-point rating scale) than when it referred to tuition fees ($\underline{M}$ = 2.8). These results, and additional analyses of subjects' interpretations of the question, indicated that respondents interpreted the meaning of the fictitious issue on the basis of the preceding question.

Two different aspects render the content of preceding questions especially likely to serve as a context cue for determining the pragmatic meaning of a subsequent question. First, the order of questions often constitutes a conversational context per se, because adjacent questions in a social discourse should relate to each other (Grice, 1975). Second, the content of preceding questions is highly accessible for subjects, because the information was recently activated (Higgins & King, 1981). According to these considerations, responses to ambiguous questions

may be biased toward an interpretation based on the preceding question. If a systematic effect of the preceding question on the interpretation of a target question is not intended, special attention should therefore be given to the potential implications of the preceding question(s). In order to avoid unintended effects, it may not be enough to pretest the meaning of isolated parts of the experiment, e.g. the question assessing the most important dependent variable. As the presented findings suggest, the meaning of an instruction or question can change depending on the context in which it is presented. Although probably more effortful, it seems useful to pretest instructions and questions in the experimental context in which they will finally be presented.

Response Alternatives

As outlined above, subjects' search for cues to determine their task will not be restricted to any specific element of the experimental setting. In addition to instructions and preceding questions, the response alternatives provided as part of a question may also be used to determine the question's intended meaning (cf. Schwarz & Hippler, 1987, 1991; Schwarz, 1990, for a more general discussion). Suppose, for example, that respondents are asked to indicate how frequently they were "really irritated" recently. Before giving an answer, the respondent must decide what the researcher means by "really irritated". Does this refer to major irritations, such as fights with one's spouse, or does it refer to minor irritations, such as having to fight for service in a restaurant? Again, respondents are likely to consider the context of the question to determine its meaning. In order to know what the question exactly refers to, subjects may use the information provided by the response alternatives.

A study by Schwarz, Strack, Müller, and Chassein (1988) supports this assumption. Respondents who were asked to report how often they were "really irritated" on a scale ranging from "several times a day" to "less than once a week" considered instances of less severe

irritations to be the target of the question than respondents who were presented a scale ranging from "several times a year" to "less than once every three months". Specifically, the former reported "typical examples" of their irritating experiences that were rated as significantly less severe than the latter. Thus, subjects used their general knowledge about the frequency of mild and severe irritations in combination with the response alternatives provided to them, to determine the (presumably) intended meaning of the ambiguous term "really irritated". As a result, the two identically worded questions assessed frequency reports of substantively different behaviors, depending on the frequency range of the response alternatives that were provided.

In general, subjects assume that the response alternatives presented to them are meaningfully related to the nature of their task (cf. Schwarz & Hippler, in press) -- or why else would the researcher provide them in the first place? Based on this assumption, they extract information from the response alternatives to determine the exact meaning of the question asked (for response alternatives affecting conjunction errors see also Dulany & Hilton, 1991; Politzer & Noveck, 1991). This informational function of response alternatives implies, however, that they can also be a source of systematic bias (cf. Schwarz, 1990; Schwarz & Hippler, 1991, for reviews).

Whereas the preceding study focused on response alternatives presented as part of a question, similar considerations apply to behavioral response alternatives. Again, the experimenter's contributions about the purpose of the study may be interpreted in the context of the behavioral alternatives provided to subjects. For example, subjects in Orne's (1962) study were asked to do a page of simple computations, then tear up the answer sheet in pieces, and continue to the next page. He found that subjects continued to do so for several hours with only few errors. The only response alternative to adding up the numbers would have been to leave the experiment. As adding up numbers and then tearing the answer sheet apart is not a

meaningful task per se, subjects needed to infer another meaning for this task. Subjects could construct a meaning by using the fact that they had only one response alternative - except for leaving the experiment. Orne, who was originally interested in finding a task subjects refused to perform, assumed that subjects inferred that the task was designed to test their persistence (Orne, 1962). Suppose subjects in Orne's experiment would have been informed that the experiment was dealing with the evaluation of different tasks and that when they had enough experience with the presented computation task they had the opportunity to evaluate other tasks. Most likely, the additional response alternative would have dramatically changed Orne's findings regarding his subjects' "persistence".

As a consequence of the reviewed findings, experimenters should examine whether the response alternatives are meaningfully related to the ostensible task. If this is not the case, interpretations of the results should be considered in the light of the additional information provided by the response alternatives.

Determining Which Information Should be Used

Once subjects have determined the intended meaning of the instructions, they will search for information to complete the task. Often, however, subjects are provided with various kinds of information. Thus, they have to decide whether a specific piece of information is task-relevant or not. Again, we assume that subjects apply the maxims of the co-operative principle.

As the most fundamental requirement of the co-operative principle is to be informative, subjects should not expect to receive irrelevant information (Grice, 1975). Thus, unless clearly indicated otherwise, they will perceive all the information given as potentially relevant and will attempt to relate it to their task. The experimenter needs to account for this process in the interpretation of subjects' responses.

Information not meant to be relevant for the experimental task may be used by the subject in at least two ways. First, it can be used directly for the solution of the experimental task by integrating it into a response decision. For example, if asked to rate the competence of a target person, subjects might use information not meant to be relevant. Thus, they may integrate a target's group membership in their judgment, because the experimenter did provide this information and they assume it therefore as relevant, although they would not have done so in a more natural situation. Second, irrelevant information can affect subjects' responses indirectly by serving as a context for determining the pragmatic meaning of the instructions. For example, in a study on persuasion processes, recipients' attitudes were differentially affected by strong vs. weak arguments depending on the cover story used to justify exposure to the persuasive message (Bless, Bohner, Schwarz, & Strack, 1990). Although both cover stories had no direct implications for the attitude judgment, the quality of the arguments had more impact when subjects were told that the study addressed "different aspects of information evaluation" rather than "different aspects of language comprehension".

That subjects may rely heavily on information provided by the experimenter simply because it is provided, although it may seem irrelevant on substantive grounds, is not unknown to social psychologists. Zukier (1982) provided subjects with information about a target's studying time and asked them to predict the target's grade point average. He found that adding worthless information (e.g. how many siblings the target had) reduced the impact of the more useful study time information on subjects' predictions (see also Nisbett, Zukier, & Lemley, 1981) - presumably because by relying on the maxim of relevance subjects interpreted the "worthless" information to be relevant.

Similar findings emerged in studies on the base-rate fallacy (e. g., Kahneman & Tversky, 1973). These studies consistently found that individuating information exerted more

impact on subjects' probability judgments than base-rate information. For example, subjects were asked to estimate the likelihood that a target person, randomly drawn from a sample of engineers and lawyers, is a lwayer or an engineer. They received a description of the target person that presented features representative of engineers, and were provided with information about the distribution of lawyers and engineers in the sample. Reflecting a pronounced impact of the individuating information, subjects found it more likely that the target was an engineer rather than a lawyer, independent of the base-rate probability. Thus, subjects used the less relevant individuating descriptions at the expense of the normatively more relevant base-rate information.

Examining the original instructions, Schwarz, Strack, Hilton, and Naderer (1991) suspected that this effect could partly be due to subjects' reliance on the experimenter's compliance with the co-operative principle. The instructions stated that thumbnail descriptions had been written on the basis of personality tests administered by psychologists. Along with the base-rates, subjects were told that experts were highly accurate in assigning the probability judgments. Because psychologists can be assumed to be experts on issues of personality rather than on base-rates, this description grants a high degree of relevance to the individuating information. By stating that these experts were highly accurate in their judgments, the relevance of the individuating information is further increased, as the experimental task was to determine subjective probabilities matching those of the experts.[3] In summary, in the light of the co-operative principle, the instructions and procedures rendered the individuating information highly relevant.

To test these assumptions, Schwarz et al. (1991) conducted a modified replication of Kahneman and Tversky's (1973) study. Subjects estimated the probability that a target person was either an engineer (base-rate 30%) or an lawyer (base-rate 70%). The task was either

presented in a psychology framework (replicating the original instructions) or in a statistics framework. In the latter, the presumed experts were statisticians who were able to solve the task accurately. In addition, the applicability of the co-operative principle was manipulated by informing subjects that the person descriptions were either written by a human communicator, namely a psychologist, or that the descriptions were compiled by a computer randomly drawing several pieces of information from a file pertaining to the target person.

The results demonstrated that subjects were more likely to rely on the less relevant individuating information, the more the context suggested that it was relevant. Thus, they weighed the less relevant personality information more when they were told that psychologists were good at solving the task than when they were told that statisticians did well. And subjects relied on personality information more when it was presented as a thumbnail personality description by a human expert -- whose communications they could believe to be informative and relevant -- than when it was presented as randomly drawn by a computer.[4] These weighing decisions seem perfectly reasonable, if the information provided were relevant. However, the experimenter intentionally constructed an uninformative message in a context that suggested otherwise, thus violating the co-operative principle on which subjects relied in their interpretation of the task.

These findings suggest that the perceived relevance of information for a specific experimental task is only partly determined by the requirements of the task itself (for other effects of conversational norms on the use of base-rate information see Krosnick, Li, & Lehman, 1990). Rather, any information provided by the experimenter seems relevant, simply by virtue of being provided, in line with the maxim of relevance. This can result either in a direct use of this information for the solution of the task, or in indirect use to determine the nature of the task. Thus, any given information can be considered relevant and can be used, if

its relevance is not discredited in other ways. The effects of task irrelevant information are expected to be accentuated whenever the nature of the experimental task is ambiguous and instructions are vague. In this case, the presumably "irrelevant information" is likely to be used to determine the nature of the task.

As the maxim of relevance implies, "irrelevant" information provided by filler tasks or cover stories cannot by default be considered as unrelated to the experimental task in focus. The presented findings support the assumption that subjects are likely to use any information given. Often, however, it is inevitable to provide subjects with cover stories or filler tasks, and therefore to include information that the experimenter considers as irrelevant to certain parts of the experiment. Consequently, if irrelevant information is provided, it seems necessary to explore how this information could potentially be used for the task and how it might change the perceived purpose of the task.

Determining Which Information Should be Provided

When asked to provide information to the experimenter, subjects will have to consider which information the experimenter wants to have. Again, subjects can rely on the co-operative principle to determine which information to provide. According to this principle, participants in an interaction do not only assume their partner to be co-operative, but should be co-operative themselves as well. The maxim of quantity requires the recipient of a question to provide only information that is not already known to the experimenter. Information which has already been given, e.g. in responding to a previous question, should therefore be considered as uninformative -- and its repeated use would violate the maxim of quantity. Psychologists of language have termed this mechanism the "given-new contract". This contract follows from the maxim of quantity and emphasizes that contributions should provide "new information" rather

than information that has already been "given" (Clark & Haviland, 1977; Clark, 1985). If the "given-new contract" is assumed to guide the interaction in an experimental situation, it will affect subjects' responses. In trying to be informative, subjects should not provide information that they have already given.

Strack, Martin, & Schwarz (1988) investigated this possibility. In their study, American college students were asked to report their general life satisfaction as well as their dating frequency. The two questions were asked in different orders. When the general life satisfaction was assessed prior to the frequency of dating, the correlation between both variables was low, $\underline{r} = -.12$, n.s. Reversing the order dramatically increased the correlation to $\underline{r} = .66$, reflecting the impact of increased cognitive accessibility (cf. Bodenhausen & Wyer, 1987). Thus, respondents were more likely to consider their dating behavior in making judgments of life-satisfaction when their attention was directed to it by the preceding question than when it was not. In a third condition, the perceived conversational context was manipulated. The two question were explicitly placed in the same conversational context by a lead-in that read: "Now we would like to learn about two areas of life that may be important for people's overall well-being". In this condition the correlation dropped from $r = .66$ to $r = .15$, suggesting that respondents did not consider their dating behavior when they evaluated their life, despite the fact that its accessibility was increased by the previous question. Presumably, subjects did not use this information in forming a judgment because they had already given it. Thus, the finding reflects a deliberate disuse of highly accessible information due to the given-new contract (see also Schwarz, Strack, & Mai, 1991).

If subjects assume the given-new contract to be valid in experimental situations, they should not repeatedly provide the same information. Nevertheless, in experiments the same or slightly different questions are often asked several times (e.g. in experiments on attitude change

with a pre- and post test design, or in longer item batteries designed to tap the same underlying attitude). According to the co-operative principle subjects do not expect to be asked the same question twice, and will therefore wonder why the second question is asked. Thus, remembering the content of the first question can evoke two different mechanisms. First, subjects could assume that the second question pertains to a different issue than the first one and their responses will be based on this change of meaning (cf. Strack et al., 1991, for experimental evidence to be discussed below). Second, if subjects assume the same meaning of the question, e.g. because they remember the exact wording, they should infer that the experimenter has good reason to ask the same question twice. The most plausible reason from the subjects' point of view is that the experimenter expects that the answer could have changed. This conclusion then provides a very strong basis for bias effects.[5]

In sum, the presented evidence suggests that subjects' inferences in the experimental situation are heavily influenced by the co-operative principle and its maxims. Additional evidence for this conclusion is summarized by Hilton (1990, 1991). Whereas all language processing requires the kind of inferences described here, this requirement is particularly pronounced in standardized experiments and surveys, where the opportunity for appropriate feedback is highly restricted.

Although the present conceptualization differs from a motivational position (Orne, 1962), there is some interesting overlap. Both perspectives assume that (a) subjects are active participants rather than passive respondents, (b) the mediating processes are not necessarily conscious, (c) high control of the experimenter over the situation is a potential source of bias, and most importantly, (d) that the context provides the basis for demand effects (Orne, 1962). The two perspectives differ in their understanding what "acting co-operatively" means and how the effects are mediated.[6]

Implications for Strategies to Minimize Demand Effects

Not surprisingly, experimental psychologists have been aware of potential bias in their research for a long time and have developed strategies to minimize artifacts (see Aronson et al., 1990). In the final section we want to relate implications of the communication perspective to some of the strategies used.

Asking for Subjects' Help

As one strategy to minimize demand effects it has been suggested to ask subjects for their help (Aronson et al., 1990; Fillenbaum, 1966; Weber & Cook, 1972). For example, subjects are often informed that their responses are important and that their help and cooperation is required for investigating major research questions. This strategy may increase subjects' motivation and reduce effects of social desirability and self presentation. Quite intentionally, this strategy defines the relationship as one of mutual trust, in which subjects will not be intentionally misled. Accordingly, increasing the importance of the experiment and asking for subjects' help may also increase subjects' reliance on any information offered to them and may increase their effort to determine the "correct" intended meaning.

As both asking for subjects' help as well as reducing the perceived importance of the experiment is problematic, discrediting the co-operative maxims could be seen as a possible solution (Cook, Bean, et al., 1970). Specifically, subjects could be informed that through the course of the experiment they might be provided with irrelevant, ambiguous, too much or too little information for their tasks. This "solution", however, causes other severe problems. For example, subjects might extensively evaluate each piece of information to determine whether it is relevant or not. Besides making research on cognitive processing almost impossible, such a strategy is likely to result not only in a reduced use of irrelevant, but also of relevant

information.

Deception

In order to avoid demand effects, deceiving subjects is perhaps the most frequent technique currently used (Aronson et al., 1990). If subjects are provided with a plausible and coherent cover story -- or even an ostensible hypothesis --, the search for determining the pragmatic meaning will most likely be guided by this information. Under these circumstances it seems easier to predict subjects' understanding of the pragmatic meaning. Note, however, that subjects will still determine this meaning on the basis of the maxims of the co-operative principle. To reduce potential bias it seems therefore necessary to relate the pragmatic implications of the cover story to the real hypothesis and to consider the possible relations.

The "Two experiments paradigm"

Another common technique is to separate the experimental manipulations from the assessment of the dependent measures by informing subjects about an ostensible first and second study and by changing the experimenters. A separation may reduce the likelihood that subjects' responses are determined by their motivation to verify the experimenter's hypothesis. However, such a separation will not preclude that the co-operative principle affects the interpretation of the situation. A communication perspective would imply that questions and tasks may be interpreted differently depending on whether they are apparently asked by one or by two different experimenters.

Strack, Schwarz, and Wänke (1991, Experiment 2) investigated the effects of a one vs. two experiments paradigm on the interpretation of questions. Subjects' responses to two questions about happiness and satisfaction with one's life showed a higher correlation if subjects

assumed that they gave their answers to two different than to the same experimenter. The difference in correlation coefficients indicates that the second question was interpreted differently depending on whether it was asked by the same or another communicator, in line with the "given-new contract" discussed above.

In addition to eliciting different interpretations of the same question, the two-experiments paradigm may influence subjects' responses if subjects perceive a potential influence of the "first" on the ostensible "second" study. If subjects assume that their task in the "first" study may influence their answers in the "second" study, they may try to adjust for this possible influence in order to give true, accurate, and informative responses. Note that this does not imply that subjects perceive the "two" studies as intentionally related -- they only need to be aware of a potential impact. For example, if subjects assume that a certain piece of information comes to mind because it was brought to their attention in the apparently unrelated "first" experiment, they may attempt to exclude this information from the data-base for subsequent judgments. Such intentional exclusion processes have been shown, however, to affect subsequent judgments in a variety of ways (cf. Schwarz & Bless, 1992, in press, for a detailed discussion). Similarly, subjects may try to "correct" their responses for the perceived influence. In doing so subjects require a "theory" about the direction and the amount of the perceived impact (Jacoby & Kelley, 1987). As it is unlikely that subjects do have access to this type of knowledge (Nisbett & Wilson, 1977), the perceived impact for which they correct will probably be over- or underestimated (Strack, in press, b).

Evidence for these considerations has been provided by Strack, Schwarz, Bless, Kübler, and Wänke (in press). In a "first" study subjects were subtly primed with trait categories with either positive or negative implications for a judgment task in an ostensible "second" study. In addition, half of the subjects' attention was directed towards the source of the influence.

Subjects who were not reminded of the priming episode rated the target more positively when the primes had a positive than a negative valence, replicating findings of previous studies (e.g., Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1979, 1980). If, however, subjects were reminded of the priming event, a positive prime resulted in more negative ratings than a negative prime. The findings suggest that as long as subjects were not aware of a potential influence the primed information was used in forming a representation of the target -- resulting in an assimilation effect. If, however, subjects were reminded of priming episode the primed information was not used in forming a representation of the target, but served as a standard of comparison -- resulting in a contrast effect. This suggests that subjects may deliberately disregard highly accessible information, presumably in order to avoid a potential influence and to give accurate, unbiased answers. In sum, these findings suggest that effects due to the co-operative principle cannot simply be eliminated by the "two-experiments paradigm".

Pre- and Post-Tests to Explore the Perceived Purpose of Procedures

Experimenters do not only rely on strategies designed to avoid demand effects but also try to control for these effects by probing into subjects' hypothesis after they took part in the experiment (cf. Carlopio, Adair, Lindsay, & Spinner, 1983). This technique, however, seems only useful if subjects are aware of the experimenter's hypothesis. As outlined above, a change of the psychological meaning of the treatment mediated by conversational rules is not necessarily related to an explicit assumption about the hypothesis. Therefore, asking subjects for their beliefs about the hypothesis is unlikely to discover these kinds of bias. Instead, or in addition, it seems very useful to pretest instructions and questions to discover whether the intended meaning equals the inferred meaning. Experimenters could expose some subjects to the whole actual experiment -- and not only to the critical sequences -- to ensure that pretest

subjects are provided with the whole context. Then, all context cues are potentially available when subjects determine the pragmatic meaning of the instructions or questions. Depending on the duration of the experiment, it seems useful to stop the experiment several times to ask subjects what they think is meant by the instructions and questions. This procedure, which is becoming increasingly common in pretesting survey questions (cf. Belson, 1981), would detect discrepancies between the experimenter's and the subjects' understanding of what is meant in the very situation. In addition, in the long run, experimenters would become more sensitive to how subjects infer the intended meaning.

Instead of a pretest experimenters could ask subjects after the experiment, what they thought was meant by the instructions and questions. However, as the intended meaning of instructions and questions could change while the experiment is proceeding, a "post-test" has the disadvantage of relying on subjects' memory of the crucial situation.

In summary, the perspective offered here focuses on potential bias due to discrepancies between the experimenter's intended and the subjects' inferred meaning of the treatment. We argue that the described effects cannot be eliminated in ways that are used to eliminate bias due to subjects' motivation to comply with the suspected hypothesis. It therefore seems desirable for experimenters to develop a sensitivity how even subtle cues can lead to a misunderstanding between them and their subjects. Knowing how subjects apply their knowledge about conversational norms in everyday communication to the experimental setting could contribute to this development.

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Footnote

1. The role of a good subjects may consist in contributing to the process of research (Orne, 1962, 1969) or to make a good impression by responding as would a healthy, intelligent, normal subject (Rieken, 1962). Often, but not always (Sigall, Aronson & Van Hoose, 1970), the two aspects will have the similar implications for subjects' responses, i.e. to comply with the experimenter's hypothesis.

2. By a similar mechanism, the experimenter's contributions might implicitly inform the subjects about the actual hypothesis. This hypothesis may then provide a basis for subjects' tendency to comply with the experimenter's hypothesis (Orne, 1962).

3. Additionally, the relevance of the individuating information is increased by holding the base-rate constant and varying the individuating information for five different targets. Thus, judgments grounded only on the base-rate would result in the same solution for all five tasks.

4. The present data indicate that subjects' apparent overreliance on individuating information and neglect the base-rate information is to a considerable degree due to the impact of the co-operative principle. While this finding should serve to moderate complaints about individuals' insensitivity to base-rates, in does not invalidate the research on the representativeness heuristic. However, the degree to which they rely on this information has been exaggerated in some classic experiments due to the discussed mechanisms.

5. Note, that remembering the answer is not essential for both mechanisms.

6. It seems interesting to note that the two perspectives imply different effects of subjects' sophistication with psychological experiments. According to a communication perspective, prior experience with experiments, especially experiments involving deception, should reduce subjects' reliance on the rules of communication. As a consequence, subjects are less likely to base their search for context cues and their inferences on the maxims of the cooperative principle. Thus, bias effects mediated by applying the rules of communication should decrease with the increase of experimental experience. From a motivational perspective it is plausible to assume that subjects' ability to detect the correct hypothesis should increase with experimental experience. Therefore, demand effects should be more pronounced for subjects' with prior experience with psychological experiments. As the predictions of the communication perspective has not been tested, and as the evidence for the prediction implied by the motivational perspective is rather mixed (for an overview see Kruglanski (1975), an empirical evaluation of this question is yet not possible.

Table 1. The Maxims of the Co-operative Principle

Maxim of Quantity

Make your contributions as informative as required, but not more informative than is required.

Maxim of Quality

Try to make your contribution one that is true. That is, do not say anything you believe to be false or lack adequate evidence for.

Maxim of Relation

Make your contribution relevant to the aims of the ongoing conversation.

Maxim of Manner

Be clear. Try to avoid obscurity, ambiguity, wordiness, and disorderliness in your use of language.

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